

EVALUATION OF MACROLIDES AND LINCOSAMIDES CONSUMPTION IN EMERGENCY MEDICINE INSTITUTE

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Rezumat. Evaluarea consumului de macrolide și lincosamide în Institutul de Medicină Urgentă

Macrolidele și lincosamidele sunt utilizate pentru combaterea infecțiilor, atât sistemice cât și locale, prezentând în acest fel un interes sporit în tratamentul pacienților spitalizați. Acest studiu are scopul de a analiza utilizarea macrolidelor și lincosamidele în cadrul IMU pe parcursul anului 2009 în 2014, precum și compararea cu utilizarea lor în spitalele din alte țări. În 2014, în instituție, secțiile de asistență medicală intensivă și secțiile septice sau consumat respectiv 8.58; 2.9 și 1.5 DDD/1000 sau o scădere bruscă comparativ cu 2013 respectiv cu 23.2; 3.84 și 22.44 ori. În 2014 costul pentru DDD/1000 înregistrat în secțiile de asistență medicală intensivă a fost de 40.01 lei sau cu 36.71 de ori mai mare decât costul de 1.09 lei în secțiile septice și respectiv mai mult cu 71,14% decât 21.45 lei pentru DDD/1000 în total pe IMU. Rezultatele obținute demonstrează o conexiune instabilă date a consumului anual de macrolide și lincosamide înregistrat în IMU, și vice-versa unul stabil în spitale internaționale, care reprezintă un argument important pentru optimizarea consumului și îmbunătățirea utilizării raționale a antibioticelor în spitale.

Cuvinte-cheie: macrolide, lincosamide, doza definită pentru o zi, consum, rațional, spital

Summary

Macrolides and lincosamides are used to treat both systemic and local infections and in this way presenting a great interest in the treatment of hospitalized patients. This study has the aim to analyze the use of macrolides and lincosamides in the in EMI during 2009 to 2014, and also to compare it with worldwide hospitals. In 2014 in whole institution, ICUD and SSOTD were recoded 8.58; 2.9 and 1.5 DDD/1000 or an abrupt decline in consumption comparatively with 2013 by respectively 23.2; 3.84 and 22.44 times. In 2014 cost per DDD/1000 recorded in ICU departments was 40.01 lei or by 36.71 times more than cost of 1.09 lei in SSOTD departments and respectively more by 71.14% than 21.45 lei in all EMI. The obtained results in this study demonstrate an instable data of yearly macrolides and lincosamides consumption registered in EMI, and vice versa a stabile one in international hospitals, that represents a important argument for improvement and optimization consumption, as well as rational use of antibiotics in all others hospitals.

Key words: macrolide, lincosamide, defined daily dose, consumption, rational use, hospital

Резюме. Изучение расхода макролидов и линкозамидов в Институте Ургентной Медицины

Макролиды и линкозамиды используются для лечения как системных и локальных инфекции, представляя, таким образом, большой интерес в лечении госпитализированных больных. Цель данного исследования провести анализ расхода макролидов и линкозамидов в Институте Ургентной Медицины в период 2009 - 2014 годов, а также сравнить полученные данные с аналогичными в госпиталях других стран. В 2014 году в целом по Институту, отделениях интенсивной медицинской помощи и гнойных отделениях было израсходовано соответственно 8,58; 2,9 и 1,5 ССД/1000, что по сравнению с расходом в 2013 годом является резким снижением соответственно на 23,2; 3.84 и 22.44 раза. В 2014 году стоимость за ССД / 1000 в отделах интенсивной медицинской помощи было 40,01 леев, или на 36,71 раза больше, чем стоимость 1,09 лей за ССД / 1000 в гнойных отделах и соответственно больше на 71,14% больше, чем 21,45 лей по учреждению. Результаты данного исследования демонстрируют нестабильный ежегодный расход макролидов и линкозамидов в Институте Ургентной Медицины, и наоборот, стабильный по сравнению с аналогичными данными в больницах других стран, что представляет собой важный аргумент для улучшения и оптимизации планирования, а также рационального назначения антибиотиков во всех других больницах.

Ключевые слова: макролиды, линкозамиды, среднесуточная доза, расход, рациональное использование, госпиталь

Introduction

The group of macrolides and lincosamides are antibiotics with a broad spectrum of activity against many gram-positive bacteria and gram-negative, which are used to treat both systemic and local infections including upper respiratory tract infections, urinary tract infections, arthritis, and others, in this way gaining a great interest in treatment of hospitalized patients, [1, 2]. Increment of antibiotic consumption and resistance is one of the most serious global threats to the treatment of infectious diseases [3, 4]. Actually in ATC/DDD program is registered 14 macrolides remedies and 2 lincosamids [5], five of them currently are available for use in the United States, [6], in Republic of Moldova for utilization are admitted 7 macrolides remedies and 2 lincosamids, [7] and for the patients treatment in EMI are utilized 4 macrolides remedies and 1 lincosamid remedies, [8].

Determined in EMI yearly medium consumption from 2009 to 2013 recorded 39.38 DDD/1000, that was less by 53.44% than 84.58 DDD/1000 registered in Large acute Australian public Hospitals and by 26.57% than 53.63 DDD/1000 recorded in other international hospitals, [9]. However in some European countries like The Netherlands consumption of macrolides and lincosamides in hospitals recorded an yearly medium of 30.36 DDD/1000 or 6.03% from annual medium of 503.4 DDD/1000, [10, 11, 12] that is more appropriate to the data used in EMI.

The primary aim of the study was to evaluate institutional representative data on macrolides and lincosamides utilization in accordance to World Health Organization (WHO) requirements, directed to determine value of Defined Daily Doses per 1000 Occupied-Bed Days (DDD/1000) and value cost in the dynamics per total institution and most important departments, [13].

Material and methods

For this study were used the data of a six-year (2010-2014) period consumption of macrolides and lincosamides antibiotics in EMI (Emergency Medicine Institute) and their main subdivisions as following: ICU that include (Reanimation, intensive Therapy and intensive Neurological „STROKE” departments) and SSOTD (septic Surgical and septic Orthotraumatology departments) which show the consumption dynamics of anti-infective for systemic use drugs as classified by Anatomical Therapeutic Chemical (ATC) classification system of World Health Organization (WHO) indicated in grams and value indexes. Statistical, analytical, mathematical, comparative, logical and descriptive were used as the methods of study.

Results and discussion

For determining the DDD/1000 we used data about total annual consumption of macrolides and lincosamides and the statistics data concerning the number of treated patients (only patients with health insurance and other free treated by the state categories of citizens). The total number of occupied bed/days in the institution was 188762 in 2009. 191556 in 2010. 186246 in 2011. 199816 in 2012. 193019 in 2013 and 187558 in 2014. and respectively for the evaluated departments of EMI: Reanimation intensive care unit (2009 = 3990; 2010 = 6551; 2011 = 6985; 2012 = 9051; 2013 = 7384; 2014 = 7361), Therapeutic intensive care (2010 = 2922; 2011 = 3327; 2012 = 3239; 2013 = 3407; 2014 = 3388), “STROKE” intensive care (2013 = 2553; 2014 = 4193), septic Surgical (2009 = 14030; 2010 = 14212; 2011 = 12875; 2012 = 12372; 2013 = 12464; 2014 = 12104), septic Orthopedic-traumatology (2009 = 10664; 2010 = 10017; 2011 = 9540; 2012 = 10178; 2013 = 9701; 2014 = 9535), [14, 15, 16, 17].

Consumption of macrolides and lincosamides

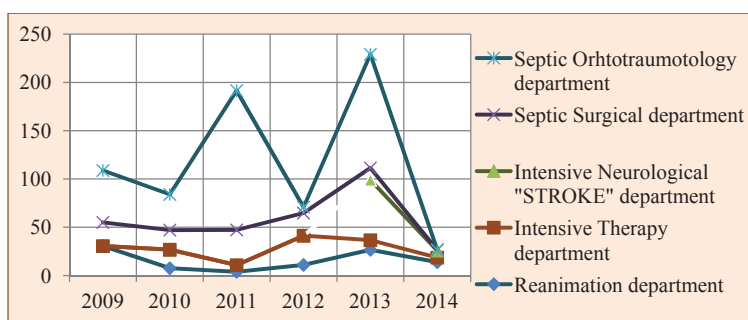


Fig. 1. Total macrolides and lincosamides consumption in DDD/1000 during 2009–2014

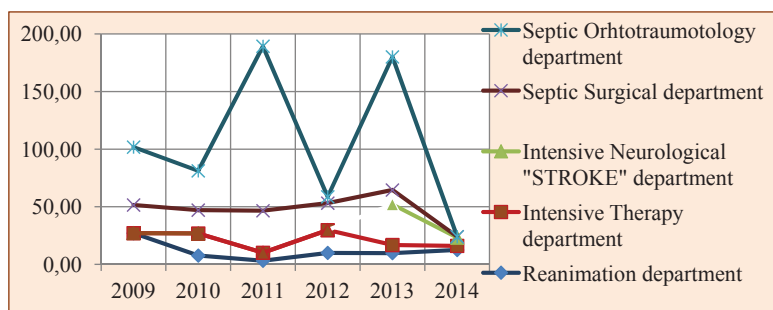


Fig. 2. Total macrolides and lincosamides consumption in DDD/1000 (parenteral forms)

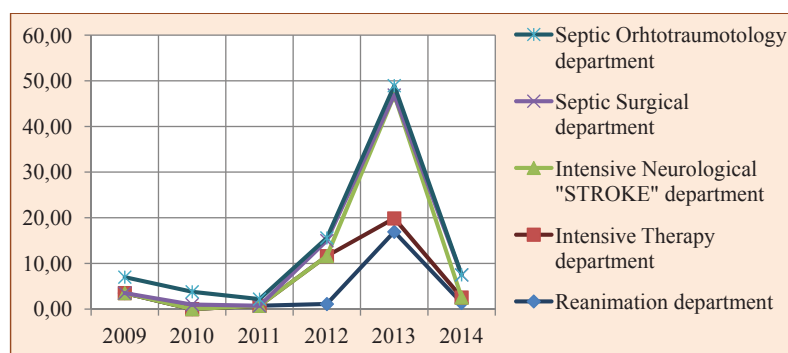


Fig. 3. Total macrolides and lincosamides consumption in DDD/1000 (enteral forms)

antibacterial in EMI is characterised by the use of parenteral (P) and enteral (E) forms as following: erythromycin DDD 1.0 E, midecamycin DDD 1.0 E, clarithromycin DDD 0.5 EP, azithromycin DDD E0.3, P.5, lincomycin DDD 1.8 P. Total macrolides and lincosamides consumption in DDD/1000 during 2009-2014 is shown in **figure 1**.

From **figure 1**, it can be observed a total decrease of macrolides and lincosamides consumption for all departments from 108.77 in 2009 to 26.56 DDD/1000 in 2014 or by 75.58% and varied considerably in every subdivision during the evaluated period. Since 2009 to 2013 was recorded an increase from 108.77 to 229.07 DDD/1000 or by 52.52%, while from 2013 to 2014 a decrease to 26.56 DDD/1000 or by 88.41%. This spontaneous mitigation was probably a result of some difficulties in the supply system of this group of antibiotics in the institution. Annual medium (from 6 years) consumption per all departments of 144 DDD/1000 in the evaluated period, could be placed as following: first – septic Orthotraumatology

department with 59.77 DDD/1000 or 41.52%, second - Intensive Neurological «STROKE» department with 34.72 DDD/1000 or 24.11%, third - septic Surgical department with 19.67 DDD/1000 or 13.66%, fourth - Reanimation department with 15.61 DDD/1000 or 10.84% and the fifth position Intensive Therapy department with 14.21 DDD/1000 or 9.87%. In **figure 2** the total macrolides and lincosamides consumption of parenteral forms in DDD/1000 during 2010-2014 is shown.

From **figure 2**, it could be observed that consumption of parenteral forms, because of low consumption of enteral forms of use, in the mean is similar to total consumption data of this group of antibiotics and a separate description isn't necessary.

In **figure 3**, DDD/1000 of macrolides and lincosamides (enteral forms) consumption during 2009-2014 is shown.

Figure 3 shows that in the evaluated period enteral forms of macrolides and lincosamides recorded an instable and episodic consumption in

all departments with an abrupt increase from 2.19 in 2011 to 48.96 DDD/1000 in 2013 and a similar decrease to 7.5 DDD/1000 in 2014.

Taking into consideration the fact that in most scientific journals published data about drugs consumption include use of them in all intense care units we determined medium consumption of DDD/1000 separately for ICUD and SSOTD of EMI by counting total of DDD/1000 separately for ICU and SSOTD and divided to the number of those departments (3 and respectively 2). The results are shown in table 1.

The data in **table 1** shows that in the evaluated period annual consumption of DDD/1000 in EMI decreased from 44.4 to 1.5 DDD/1000 by 95.69%, in ICU departments from 30.58 to 8.58 DDD/1000 or by 71.94% and in SSOTD 39.1 to 2.9 DDD/1000 or by 92.58%, with the percentage of parenteral/enteral forms from the medium annual (from 6 years) consumption of respectively 96.98/3.02%, 76.56/24.13% and 95.91/4.07%. Consumption in ICUD comparatively to EMI and SSOTD departments in 2014 was $(8.58:1.5) = 5.72$ and $(8.58:2.9) = 2.96$ times more.

From **table 2**, it could be observed that during the evaluated period macrolides and lincosamides recorded a consumption in EMI and in all other hospitals less than 10% from the total. The medium (from 6 years) consumption of 33.07 DDD/1000 recorded in EMI was comparatively less by 60.90% than 84.58 DDD/1000 registered in large acute Australian public Hospitals as well as by 38.34% than 53.63 DDD/1000 recorded in other international hospitals.

The total value cost of macrolides and lincosamides use per DDD/1000 in lei is presented in figure 4.

As could be seen from **figure 4** during in the evaluated period total DDD/1000 cost in lei per all departments varied significantly with the main value of 3419.04 lei in 2010 and respectively 3982.45 lei in 2013. Calculated per DDD/1000 medium (from 6 years) annual consumption of 3300 lei in the evaluated period, could be placed as follows: first – Intensive Neurological «STROKE» department 1458.26 lei, second - Reanimation department with 705.19 lei, third - Intensive Therapy department with 665.20 lei, followed by septic Orthotraumatology

Table 1

Macrolides and lincosamides (parenteral and enteral forms) consumption of DDD/1000 in ICUD and SSOTD departments of EMI

Department	Administration /Period of evaluation	2009	2010	2011	2012	2013	2014
ICUD	Parenteral	27.07	13.4	5.03	14.85	17.35	7.73
	Enteral	3.51		0.72	5.8	15.63	1.27
	Total	30.58	13.4	5.39	20.66	32.98	8.58
SSOTD	Parenteral	37.35	27.21	89.64	14.47	64.04	0.42
	Enteral	1.75	1.9	0.74	1.99	1.03	2.48
	Total	39.1	29.11	90.38	116.46	65.07	2.9
Total EMI	Parenteral	43.7	24.2	57.2	34.5	31.9	0.9
	Enteral	0.7	0.6	0.2	1	2.9	0.6
	Total	44.4	24.8	57.4	35.5	34.8	1.5

Table 2

Total DDD/1000 consumption of macrolides and lincosamides in EMI and some international hospitals

Institution/data/year	2009	2010	2011	2012	2013	2014
Emergency Medicine Institute	44.40	24.80	57.40	35.50	34.80	1.50
Total	662.40	558.20	622.10	542.40	546.90	464.10
Percentage	6.70%	4.44%	9.23%	6.55%	6.63%	0.11%
Large acute Australian pub. Hospitals, [9, 18]	90.10	83.70	86.30	85.20	77.60	82.06
Total	931.80	933.70	946.50	931.60	943.40	936.31
Percentage	9.67%	8.96%	9.1%	9.15%	8.23%	8.76%
Other international hospitals	2001-2012	2012		2012-2013	2013	
University Hospital [19]	35.00					
DANMAP; SWEDRES		41.80	28.00			
NAUSP; [18]				86.80		
SAAUSP; NETHMAP					78.20	52.00
Total	631.00	931.00	609.00	945.00	943.00	712.00
Percentage	5.6%	4.5%	4.6%	9.2%	8.3%	7.3%

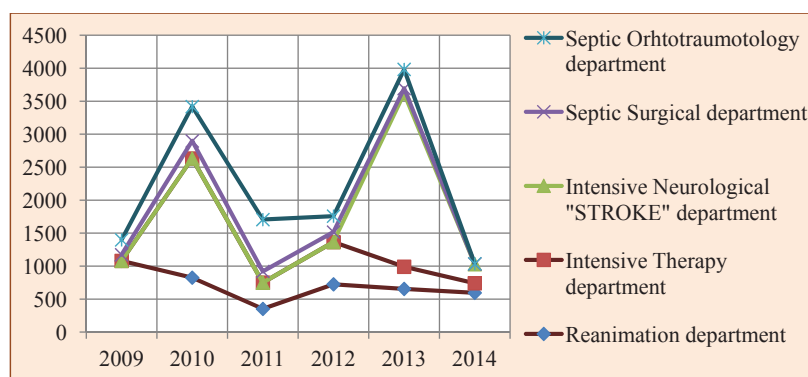


Fig. 4. Total value cost of macrolides and lincosamides per DDD/1000 in lei

department with 344.77 lei per DDD/1000 and the fifth- septic Surgical department with medium cost of 126 lei per DDD/1000. In **figure 5** the total value cost macrolides and lincosamides in DDD/1000 (parenteral forms) is presented.

The cost of parenteral macrolides and lincosamides consumption, because of low cost of enteral forms per DDD/1000 for all departments, remains approximately to the total unchanged.

In **figure 6** the value cost DDD/1000 in lei of macrolides and lincosamides enteral forms is shown.

Presented data in chart 6 demonstrates that in the evaluated period per all departments varied significantly with the lower value cost of 22.27 lei in 2011 and 6.76 lei in 2014 and respectively the

main value of 55.5 lei in 2010 and respectively 81.84 lei in 2012. Calculated per DDD/1000 medium (from 6 years) annual consumption of 48.63 lei per evaluated period, could be placed as following: first

– first septic Orthotraumatology department with the medium annual cost per DDD/1000 of 18.76 lei, second - septic Surgical department with 10.72 lei per DDD/1000 and consequently intensive Therapy department with 8.45 lei per DDD/1000, forth - Intensive Neurological «STROKE» department with 6.77 lei per DDD/1000 and fifth - Reanimation department with 3.94 lei per DDD/1000.

To determine the medium cost of macrolides and lincosamides in DDD/1000 was counted total cost of DDD/1000 separately for ICUD and SSOTD and divided to the number of those departments (3 and respectively 2) in the evaluated period. The results is presented in **table 3**.

The data in **table 3** shows that in the evaluated period annual cost in lei of DDD/1000 in EMI decreased from 209.68 to 32.17 DDD/1000 by 84.66%, in ICU departments from 1029.67 to 343.29

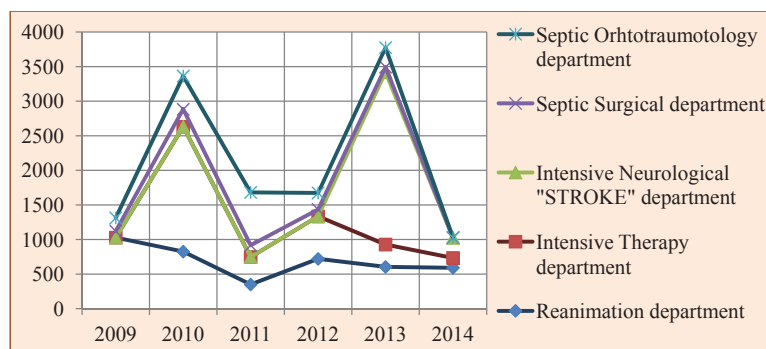


Fig. 5. Value cost of macrolides and lincosamides in DDD/1000 of parenteral forms in lei

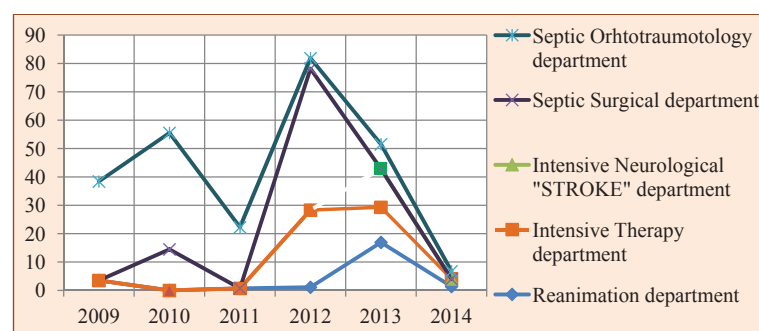


Fig. 6. Value cost of macrolides and lincosamide sin DDD/1000 (enteral forms) in lei

Table 3

Medium cost of DDD/1000 in lei of macrolides and lincosamides (parenteral and enteral forms) in EMI

Department	Structure of consumption	2009	2010	2011	2012	2013	2014
ICUD	Parenteral	1027.92	1315.77	373.55	667.06	1139.85	340.94
	Enteral	1.75	0.00	0.36	14.15	14.28	1.35
	Total	1029.67	1315.77	373.91	681.21	1154.13	343.29
SSOTD	Parenteral	142.12	366.00	467.48	169.54	177.97	1.81
	Enteral	17.43	27.75	10.77	26.77	4.34	1.36
	Total	159.55	393.75	478.25	196.3	182.32	3.17
Total EMI	Parenteral	204.97	184.53	287.99	172.74	194.2	30.59
	Enteral	4.71	9.71	1.81	8.20	8.94	1.58
	Total	209.68	194.24	289.8	180.94	203.14	32.17

lei or by 66.66% and in SSOTD 159.55 to 3.17 lei or by 98.01%, with the percentage of parenteral/ enteral forms from the medium annual (from 6 years) consumption of respectively 96.85/3.15% and 99.33/30.67%, 93.74/6.26%. Consumption in ICUD comparatively to EMI and SSOTD departments in 2014 was $(816.33:185) = 4.41$ and $(816.33:235.56) = 3.47$ times more.

Conclusions:

1. From annual medium consumption of 144 DDD/1000, in the evaluated period results, could be placed as following: first – septic Orhtotraumatology department with 59.77 DDD/1000 or 41.52%, second - Intensive Neurological «STROKE» department with 34.72DDD/1000 or 24.11%, third - septic Surgical department with 19.67 DDD/1000 or 13.66%, fourth - Reanimation department with 15.61 DDD/1000 or 10.84% and the fifth position Intensive Therapy department with 14.21 DDD/1000 or 9.87%.

2. Annual decrease of DDD/1000 consumption recorded in EMI from 44.4 to 1.5 DDD/1000 or by 95.69%, in ICU departaments from 30.58 to 8.58 DDD/1000 or by 71.94% and in SSOT departaments 39.1 to 2.9 DDD/1000 or by 92.58%, with the percentage of parenteral/ enteral forms from the medium annual (from 6 years) consumption of respectively 96.98/3.02%, 76.56/24.13% and 95.91/4.07%. Consumption in ICUD comparatively to EMU and SSOTD departments in 2014 was $(8.58:1.5) = 5.72$ and $(8.58:2.9) = 2.96$ times more.

3. Annual value cost in lei of DDD/1000 in EMI decreased from 209.68 to 32.17 DDD/1000 by 84.66%, in ICU departaments from 1029.67 to 343.29 lei or by 66.66% and in SSOTD 159.55 to 3.17 lei or by 98.01%, with the percentage of parenteral/ enteral forms from the medium (from 6 years) annual consumption of respectively 96.85/3.15% and 99.33/30.67%, 93.74/6.26%. Consumption in ICUD comparatively to EMI and SSOTD departments in 2014 was $(816.33:185) = 4.41$ and $(816.33:235.56) = 3.47$ times more.

4. Obtained results in this study show important comparative records and conection between the main departments, as well as in international hospitals registered data, that gave the opportunity to have possibility for making decisions to impruve the quality of supply, rational use of amphenicols and antimicrobial treatment of hospitalised patients.

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